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Ethylcyclopentane reactions on alumina supported low loaded platinum-copper catalysts

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Abstract

This work is focused on the catalytic behaviour of alumina supported low loaded Pt-Cu catalysts. Ethylcyclopentane is the probe molecule. In fact this molecule can lead to several primary reactions as: (i) ring opening, (ii) ring enlargement, (iii) aromatisation, and (iv) hydrocracking. Due to these various pathways we can follow the modifications of the catalytic activities as well as selectivity changes when the surface composition of the catalyst is changed. Various techniques were used to characterise these catalysts: (i) by TPR we showed that an interaction between platinum and copper is present and (ii) by hydrogen chemisorption we found that the platinum dispersion decreased from 100 to 20% when the copper content increased. The ring opening reaction is non-selective for platinum catalysts and for Pt-Cu systems with low copper content and is selective for catalysts with a high copper content. We noted that the apparent activation energy values also changed with the amount of copper which confirms the modifications in the catalytic mechanisms when changing copper concentration. We proposed that the ring enlargement reaction is similar to a bond shift reaction, when ring opening corresponds to hydrocracking reactions. Such comparative relation can help to understand the results obtained.

Author Keywords: Hydrogenolysis; Ethylcyclopentane ring opening; Alloys; Bimetallics; Pt-Cu catalysts